1992. Pages 21-27 in Proceedings CATTAIL MANAGEMENT SYMPOSIUM, (February 12, 1992, Fargo, ND)

EVALUATING RODEO^{R} HERBICIDE FOR MANAGING CATTAIL-CHOKED MARSHES: OBJECTIVES AND METHODS

George M. Linz and David L. Bergman
U.S. Department of Agriculture
Denver Wildlife Research Center
North Dakota Field Station
Fargo, ND

AND

William J. Bleier
Department of Zoology
North Dakota State University
Fargo, ND

In Minnesota, North Dakota, and South Dakota, blackbirds begin roosting in dense cattail marshes during July. These birds often roost near sunflower fields and eat significant amounts of sunflower seed (Hothem et al. 1988, Otis and Kilburn 1988). Frightening and dispersal techniques are available to reduce the sunflower damage caused by blackbirds (Dyer and Ward 1977, Bomford and O'Brien 1990); however, these methods have limitations because of cost, logistics, or limited effectiveness (North Dakota Agricultural Statistics Service 1990). Thus, new management techniques for reducing blackbird damage to sunflower are needed.

The loss and degradation of habitat have been identified as major waterfowl management problems in North America (United States Fish and Wildl. Serv. and Canadian Wildl. Serv. 1986). Marshes deteriorating from cattail invasion are used infrequently by waterfowl, in part, because of low invertebrate and benthic productivity (Murkin et al. 1982). Generally, breeding bird populations respond positively to the creation of marshes with interspersed emergent vegetation and water (Weller and Spatcher 1965, Nelson and Dietz 1966, Beule 1979). As a result, federal and state wildlife agencies (e.g., U.S. Fish and Wildlife Serv., Wisconsin Department of Nat. Res.) often frequently fragment dense cattail stands with herbicides, mechanical destruction, burning, grazing, water level manipulation, and combinations of these techniques (Beule 1979, Murkin and Ward 1980, Kantrud 1986, Schultz 1987, Solberg 1989).

Other investigators have reported on the effect of modified cattail marshes on blackbird nesting (Beule 1979, Schultz 1987, Murkin et al. 1989). To our knowledge, only Linz et al. (1992) have reported on the response of roosting blackbirds to fragmented cattail marshes. Dispersing or reducing congregations of blackbirds by altering their roosting habitat (i.e., cattails) may in turn disperse or reduce damage to sunflower.

In 1989, Linz et al. (1992) began studying the use of Rodeo^{R}, an aquatic herbicide (registered trademark of Monsanto Company, St. Louis, MO; Monsanto 1990) for fragmenting cattail marshes. Rodeo^{R} is a post-emergent, nonselective herbicide, containing the active ingredient isopropylamine salt of glyphosate (N-(phosphonomethyl) glycine). The U.S.

Department of Agriculture does not endorse Rodeo^{R} or any other product used in this study. Assessments of the treated marshes in 1990 indicated that Rodeo^{R} killed the cattails and blackbirds no longer used these marshes as roost sites. These promising results lead to an increased research effort to develop this method of eliminating blackbird roosts.

In 1990 and 1991, we continued to investigate the effects of cattail fragmentation on bird populations by comparing bird counts from 16 Rodeo^{R}-treated cattail marshes and 8 untreated cattail marshes. Our objectives were (1) to determine the feasibility of fragmenting dense cattail marshes to discourage the establishment of blackbird roosts, (2) to assess the response of breeding and migrating bird populations to altered cattail marshes, and (3) to assess the usefulness of this technique for reducing or dispersing sunflower damage. Here, we describe our research objectives and methodology and discuss preliminary observations.

STUDY AREA AND METHODS

Our study marshes are in Benson, Nelson, Grand Forks, and Walsh Counties, which are located in the prairie pothole region of North Dakota. In 1990, we selected 12 semipermanent cattail marshes (2 - 10 ha; classification of Stewart and Kantrud 1971), that contained water, had abundant cattail, and historically or potentially could harbor blackbirds. These marshes were randomly assigned 70% or 90% areal spray coverages with Rodeo^{R} or were untreated. In 1991, we selected 12 additional cattail marshes (5 - 32 ha) and randomly designated each marsh to 1 of 2 treatments (50% or 70% areal spray coverages) or were untreated.

Application

The herbicide solution was applied at 46.8 L/ha, containing 5.8 L/ha Rodeo^{R} (2.8 kg/ha glyphosate), 0.2 L/ha surfactant (Valent X-77 Spreader, Trademark of Valent U.S.A. Corporation, Greeley, CO), 0.4-0.6 L/ha drift retardant (Chem-trol, Trademark of Loveland Industries, Greeley, CO), and sufficient water to bring the solution to final volume. A fixed-winged spray aircraft began on the marsh edge and alternated between treating 15 m strips and skipping either 15, 6, or 2 m strips for 50%, 70%, or 90% treatments, respectively. Marshes were sprayed in mid- to late July. Measurable precipitation did not contact the treated plants for at least 6 hr after treatment.

Determining Herbicide Efficacy

Prior to treatment, each marsh was divided into 2 strata of equal width. We divided each stratum into 15 m strips and 1 strip was randomly selected for assessment of cattail density. A transect was established in the center of each selected strip and 10-0.25 m^2 quadrats placed along the 2 transects. The quadrat interval was obtained by dividing the total length of both transects by 10. The location of the first quadrat was a random distance in meters between the marsh edge and quadrat interval. The remaining plots were located at uniform intervals along the transect. We will count the number of live (green) cattail stems and measure depth of water within the quadrats for at least 2 years posttreatment. Additionally, aerial photos are taken of all study marshes and computer analyzed for

vegetation and water coverage.

Bird Censuses

During August, we counted blackbirds as they exited the test marshes at sunrise and as they entered to roost in the evening (Meanley 1965). In 1990, blackbirds using the 12 test marshes were counted between sunrise and 1030 hr, 1 time during the following the dates: June, July, and August. The observer(s) started counting blackbirds, waterfowl, and wading birds from the highest point near the marsh (e.g., hilltop). After completing this count, the observer(s) walked around the perimeter of the marsh recording all other species seen or heard in the marsh and within 25 m of the marsh.

In 1991, we used a fixed-radius point count method of estimating birds using test marshes (Hutto et al. 1986). Eight count points were established around the perimeter of the marsh within 5 m of the marsh vegetation (usually cattails). The count point intervals were determined by dividing the circumference of the marsh by 8. The location of the first point was a random distance between a designated corner of the marsh and count point interval. The remaining points were systematically placed around the marsh. At each count point, 2 observers waited 1 minute and then recorded all birds seen or heard during a 5 minute count period. Birds were counted 1 time during June, July, and August. We recorded new birds discovered while moving between count points for completeness but did not include these birds in our analysis. Marshes were censused in random order. The censuses were not conducted in rain or if winds exceeded 24 km/hr.

Damage Assessments

Sunflower fields surrounding each study marsh treated in 1990 were randomly selected for damage assessments. We divided each field into 4 strata, 1 row was randomly selected from each stratum, and 24-1.5 m plots were proportionally distributed among the 4 rows based on their length. Plot interval was determined by dividing the total length of the row by the number of plots assigned to that row. The location of the first plot in each row was a randomly selected distance between the field edge and the plot interval. The diameter of each head and undeveloped center was measured to the nearest cm with a measuring tape (Hothem et al. 1988). The area of seed (cm^2) missing from the head was estimated using a gridded plastic template (Dolbeer 1975).

RESULTS AND DISCUSSION

Efficacy of Spray Applications

Under the environmental conditions of northeastern North Dakota, Rodeo^R herbicide applied at 5.8 - 7.0 L/ha in July and August effectively controls cattails for at least 2 years. Rodeo^R applied at 4.7 L/ha significantly reduced cattail density after 1 year. Comes and Kelly (1989) found glyphosate applied at 3.4 kg/ha (equivalent to 7.0 L/ha Rodeo^R) in mid-September was optimum for controlling cattails in a seasonal flowing drainage ditch in central Washington. In August 1985 and July 1986, Solberg (1989) aerially applied Rodeo^R at 7.0

and 8.8 L/ha on cattail marshes in South Dakota and achieved nearly 100% control of cattails. Cattails regenerate quickly on both mud-flats and shallow water (<30 cm) marshes (Solberg 1989, Merendino and Smith 1991); whereas, wetlands with at least 30 cm of water will remain free of cattail for several years (K. Higgins, pers. commun., U.S. Fish and Wildlife, Brookings, South Dakota). We observed small, dense patches of immature cattails (<8 cm tall) growing where spikes of mature seeds had fallen into shallow water. In addition, dense stands of taller (<30 cm) seedling cattails grew in mud-flat areas of the marshes. In one marsh, these patches of cattails reached 120 to 150 cm height after 2 years but did not flower.

Cattails killed in 1989, were still present in September 1991, but the majority had fallen into the water. Mason and Bryant (1975) reported dead cattail (Typha angustifolia) shoots collapse after 2 years and take an additional 2 years to decompose completely. Burning the dead cattails in the fall or spring following treatment may be an effective way of rapidly creating openings in treated marshes. Additionally, reducing the amount of litter in the marsh may lessen any adverse effects on water quality caused by the decomposition of large amounts of vegetation.

Bird Populations

Our data indicate fragmenting solid stands of cattails with herbicide reduces their use by fall-migrating blackbirds. We speculate that dispersing blackbirds may dissipate and reduce sunflower damage. However, studies are needed to quantify sunflower damage patterns before formulating specific management recommendations.

Populations of marsh wrens and rails appear to decrease with the reduction of cattails, probably because these birds require dense emergent vegetation for foraging and nesting. We expect these populations of birds will begin to rebound as cattails repopulate the marsh. Preliminary analyses indicate the number of ducks and shorebirds did not differ between treatment and control marshes 1 year after treatment. This result is not unexpected since the dead cattails were still standing after one year. Additionally, ducks and shorebirds are probably correlated with water levels and cattail densities. Generally, marshes with dense stands of tall emergents are used less by waterfowl than marshes with interspersions of open water and emergent vegetation (Kantrud 1986). Normal water levels coupled with broken stands of emergent vegetation should increase the number of adult and young waterfowl using the test marshes (Kaminski and Prince 1981, Murkin et al. 1982). Marshes with high water levels and those that are dry probably will not harbor many shorebirds.

Economics of Using Rodeo^{R}

If managing cattail marshes proves effective in dispersing blackbirds, individual growers may substantially reduce sunflower losses. Rodeo^{R} may be cost-beneficial, especially if costs are amortized over a number of years. For example, if a 10 ha (25 A) cattail marsh harbors 20,000 blackbirds and each bird eats 14 g (1/2 ounce) sunflower per day (a conservative estimate, Besser 1979), this flock will eat 280 kg/day (617 lb/day) at a cost of $61.70/day (@ $0.10 lb). Over 30 days, the birds may damage 8,400 kg (18,518 lb) of sunflower at a cost of $1852.00. Cost of aerially applying Rodeo^{R}, using 5.8 L/ha (2.5 qt/A), is

about $151.00/ha ($61.00/A). Most of the cost (88%) is for the herbicide. The cost of treating 70 to 100% of a 10 ha marsh with 5.8 L/ha Rodeo^R is $1057 - $1510. If the treatment is effective (i.e., a blackbird roost does not form), individual growers may recoup their costs for treating the marsh in 1 year. Moreover, we expect that properly applied treatments will effectively control cattails for several years. Additionally, the sunflower grower may enhance the value of the marsh by improving the habitat for marsh birds, especially waterfowl (Kantrud 1986, Solberg 1989).

Preliminary Recommendations For Applying Rodeo^R

The U. S. Department of Agriculture, Animal and Plant Health Inspection Service, North Dakota Animal Damage Control and U.S. Department of Interior, Fish and Wildlife Service have received funding for demonstrating the use of Rodeo^R for controlling cattails used by roosting blackbirds (Louis Huffman, North Dakota Animal Damage Control, Bismarck, ND, pers. commun.) and for improving waterfowl habitat (Michael McEnroe, Wetland Habitat Office, Bismarck, ND), respectively. Therefore, we advance the following (albeit preliminary) recommendations: (1). For maximum cost-effectiveness, limit treatment to cattail marshes containing water and traditionally harboring large numbers of birds. The water will slow regrowth of cattails by inhibiting reproduction by seeds. (2). Apply Rodeo^R at 5.8 L/ha (2.5 qt/A). Under normal growing conditions, this rate should be adequate to kill the majority of the cattails (Cal Messersmith, Department of Crop and Weed Science, North Dakota State University, pers. commun.). (A 100 gal tank solution contains 12.5 gal Rodeo^R, 2 qt surfactant, 5 qt drift retardant, and sufficient water to bring to final volume). (3). At least 70% of the cattail should be killed by alternately spraying 15 m (50 ft) wide strips and skipping about 6.4 m (21 ft) between strips. Data gathered to date indicate that blackbirds will not roost in marshes with narrow strips of live cattail. (4). Although we have evidence that Rodeo^R applications sprayed from mid-July to early September effectively kills cattails, ideally treatments should be made from August until first frost. This timing will (1) maximize herbicide efficacy, (2) decrease the possibility of spray drift damaging small grain crops, and (3) avoid most young waterfowl broods.

CONCURRENT AND FUTURE RESEARCH

In 1990-91, Henry (1992) conducted field and laboratory studies on the response of aquatic invertebrates to Rodeo^R herbicide. She found no difference in the number of invertebrates surviving in untreated and treated marshes. Laboratory experiments corroborated the field tests.

In 1992, scientists from North Dakota State University and Denver Wildlife Research Center plan to (1) gather data on the efficacy of managing blackbird roosting sites for dispersing and reducing sunflower damage in 23 km^2 blocks in southeastern North Dakota, (2) assess the effects of using Rodeo^R on marsh water quality, aquatic invertebrate populations, breeding bird populations, and winter cover for gallinaceous birds, and (3) continue to evaluate the response of cattails to various application rates of Rodeo^R.

MANAGEMENT IMPLICATIONS

Our preliminary data indicate that fragmenting solid stands of cattails with herbicide, reduces their use by fall-migrating blackbirds. Additionally, restoring marshes choked with cattails to a 70:30 balance of open water and emergent vegetation may enhance the value of these marshes for other wildlife. We speculate that dispersing blackbirds may dissipate and reduce sunflower damage. Dispersing the damage over a larger area may result in more slightly damaged heads; however, these heads may compensate for seed loss by producing heavier seeds (Sedgwick et al. 1986).

LITERATURE CITED

Besser, J. F. 1979. Capability of red-winged blackbirds to damage ripening sunflower. Bird Damage Res. Rep. No. 113. Denver Wildl. Res. Ctr. 4pp.

Beule, J. D. 1979. Control and management of cattails in southeastern Wisconsin wetlands. Dept. Natural Res. Tech. Bull. 112. 41pp.

Bomford, M., and P. H. O'Brien. 1990. Sonic deterrents in animal damage control: A review of device tests and effectiveness. Wildl. Soc. Bull. 18:411-422.

Comes, R. D., and A. D. Kelley. 1989. Control of common cattail with postemergence herbicides. J. Aquat. Plant Manage. 27:20-23.

Dolbeer, R. A. 1975. A comparison of two methods for estimating bird damage to sunflowers. J. Wildl. Manage. 39:802-806.

Dyer, M. I., and P. Ward. 1977. Management of pest situations. Pp. 267-300 in Granivorous birds in ecosystems. J. Pinowski and S.C. Kendeigh (ed.). Cambridge Univ. Press, Cambridge. 431pp.

Henry, C. J. 1992. Effects of rodeo herbicide on aquatic invertebrates and fathead minnow. M.S. Thesis, South Dakota State Univ., Brookings. 63pp.

Hothem, R. L., R. W. DeHaven, and S. D. Fairaizl. 1988. Bird damage to sunflower in North Dakota, South Dakota, and Minnesota, 1979-1981. U.S. Fish Wildl. Serv. Tech. Rep. 15. 11pp.

Hutto, R. L., S. M. Pletschet, and P. Hendricks. 1986. A fixed-radius point count method for nonbreeding and breeding season use. Auk 103:593-602.

Kaminski, R. M., and H. H. Prince. 1981. Dabbling duck and aquatic macroinvertebrate responses to manipulated wetland habitat. J. Wildl. Manage. 45:1-15.

Kantrud, H. A. 1986. Effects of vegetation manipulation on breeding waterfowl in prairie wetlands - a literature review. U.S. Fish Wildl. Serv., Fish Wildl. Tech. Rep. 3. 15pp.

Linz, G. M., D. L Bergman, and W. J. Bleier. 1992. Progress on managing cattail marshes with Rodeo^{R} herbicide to disperse roosting blackbirds. Proc. Vertebr. Pest Conf. 15:56-61.

Mason, C. F., and R. J. Bryant. 1975. Production, nutrient content, and decomposition of Phragmites communis Trin. and Typha angustifolia L. J. Ecol. 63:71-95.

Meanley, B. 1965. The roosting behavior of the red-winged blackbird in the southern United States. Wilson Bull. 77:217-228.

Merendino, M. T., and L. M. Smith. 1991. Influence of drawdown date and reflood depth on wetland vegetation establishment. Wildl. Soc. Bull. 19:143-150.

Monsanto. 1990. Rodeo® Aquatic Herbicide: Complete directions for use in aquatic and other noncrop sites. Monsanto Co., Agri. Prod., St. Louis, MO. 44pp.

Murkin. H. R., and P. Ward. 1980. Early spring cutting to control cattail in a northern marsh. Wildl. Soc. Bull. 8:254-256.

Murkin, H. R., R. M. Kaminski, and R. D. Titman. 1982. Responses by dabbling ducks and aquatic invertebrates to an experimentally manipulated cattail marsh. Can. J. Zool. 60:2324-2332.

Murkin, H. R., R. M. Kaminski, and R. D. Titman. 1989. Responses by nesting red-winged blackbirds to manipulated cattail habitat. Pages 673-680 in R. R. Sharitz and J. W. Gibbons, eds. DOE Symposium Series No. 61. USDOE Office Sci. Tech. Info., Oak Ridge, TN.

Nelson, N. F., and R. H. Dietz. 1966. Cattail control methods in Utah. Utah Dep. Fish Game Publ. 66-2. 31pp.

North Dakota Agricultural Statistics Service. 1990. Blackbird evaluation survey. Cooperative Extension Newsletter, Fargo, ND. 2pp.

Otis, D. L., and C. M. Kilburn. 1988. Influence of environmental factors on blackbird damage to sunflower. U.S. Fish and Wildl. Tech. Rep. 16. 11 pp.

Schultz, B. D. 1987. Biotic responses of Typha-monodominant semipermanent wetlands to cattle grazing. M.S. Thesis, South Dakota State Univ., Brookings. 92pp.

Sedgwick, J. A., J. L. Oldemeyer, and E. L. Swenson. 1986. Shrinkage and growth compensation in common sunflowers: refining estimates of damage. J. Wildl. Manage. 50:513-520.

Solberg, K. L. 1989. Chemical treatment of monodominant cattail stands in semipermanent wetlands: duck, invertebrate, and vegetation response. M.S. Thesis, South Dakota State Univ., Brookings. 105pp.

Stewart, R. E., and H. A. Kantrud. 1971. Classification of natural ponds and lakes in the glaciated prairie region. Bureau Sport Fish and Wildl. Resour. Publ. 92. 57pp.

United States Fish and Wildlife Service and Canadian Wildlife Service. 1986. North American Waterfowl Management Plan. United States Department of Interior and Environment Canada. 19pp.

Weller, M. W., and C. E. Spatcher. 1965. Role of habitat in the distribution and abundance of marsh birds. Iowa Agric. Home Econ. Exp. Stn. Spec. Rep. 43. 31pp.